MARCONI VISIONS A NEW WIRELESS ERA

The Inventor Talks of The Micro-Waves and The Possibilities They Hold Out

By ORRIN E. DUNLAP Jr.

IN his sixtieth year Guglielmo Marconi's enthusiasm for wireless is as great as it was in his youth. Peering into the future, he foresees new ethereal miracles; today, as then, he dreams of a world run by wireless. He returned recently to this country—his eighty-seventh Atlantic crossing—"to have Americans put me wise, as they say, on what is going on over here."

Marconi, for one, will not be surprised if some day man looks by television to the far ends of the earth. In view of all he has seen in the past thirty-three years of wireless, nothing can astonish him now. To him there is no limit to the possibilities of his invention—and Marconi is noted as a modest, conservative man of science. To him the future is as widespread as the infinite into which the unseen waves are projected. Power transmission on parallel beams of wireless? Yes; that, too, is a 1933 dream which the master mind can visualize as a possibility. Who knows but that some day at the end of this century or in the next, homes, factories, aircraft, trains, ships and vehicles of all sorts will find it practicable to inhale electricity, for power and heat, from space? Marconi is not one to call it impossible.

And if any one is skeptical of these wonders, listen to Marconi's admonition: "Nothing can be labeled impossible in wireless; a month's research might change everything." Thus, when some imaginative mind suggests a fantastic achievement, such as hurling bolts of invisible power through the heavens, the wizard of wireless shrugs his shoulders, throws up his hands and exclaims: "You can never tell what science will do."

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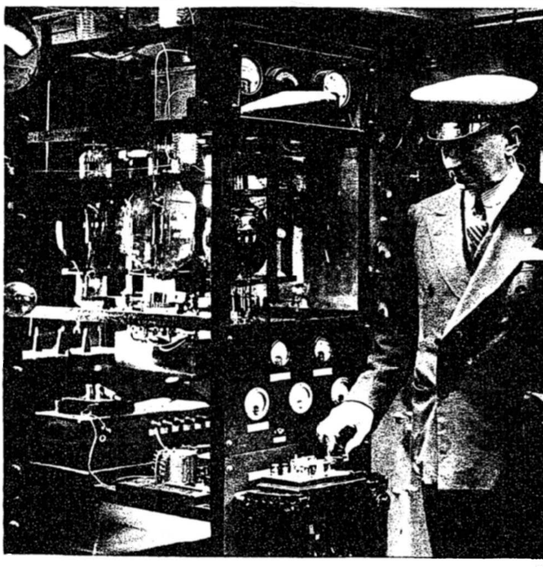
THERE were two sensational moments in Marconi's life when he saw science startle the world and dumfound theorists who had the limitations of electromagnetic waves carefully figured out on paper. The first occasion was when he heard the ether over his father's estate at Bologna pulse with feeble signals, heralding the birth of wireless telegraphy. The sages who learned of the boy Marconi and his strange contraptions stroked their beards and whispered, "A madman's dream." That was in the mauve decade.

Then came the turning point in the international drama of wireless, and it was the climax in the life of Guglielmo Marconi. Standing on the bleak coast of Newfoundland on the wintry day of Dec. 12, 1901, the young inventor plucked the first transatlantic signal from the air. The thrilling moment came shortly after noon on that memorable day, when Marconi with two companions detected the letter "s" flashed from the 20-kilowatt spark outfit set up on rocks jutting into the sea from the southwest tip of England.

Riding high in a furious gale a big kite held aloft a 400-foot wire that ran to instruments installed in the old barracks on Signal Hill, St. John's. That copper thread was the slender target the electric impulses from Poldhu had to strike in order that a tiny hammer on the coherer-detector might tap three triumphant clicks on a little glass tube.

It was all too good to be true; Marconi waited until he heard the signals again the next day before he briefly announced that the Atlantic had been spanned by wireless. There was no doubt after that day who was destined to be the master of wireless, although further experiments were necessary on ship and shore to convince mankind that a new world-wide communication system was in the offing.



Marconi in His Floating Laboratory on the Yacht Elettra.

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"Indeed, I shall never forget that day," said Marconi, "and the encouragement I received from Americans. The generosity of Mr. Edison touched me deeply, when he declared to a puzzled world, 'If Marconi says it is true, it is true.' Those words from Mr. Edison convinced many who scoffed at the idea that possibly we could talk across the ocean without the use of overhead wires or undersea cables. Of course, it was a revolutionary communication method and, if we had not known the principles of science that made it practicable, we too might have wondered about the results.

"I remember how scientists declared that wireless possessing the same properties as light waves, would travel no further than 180 miles because the earth's curvature would stop them. As soon as we put more energy into the waves, the signals covered greater mileage. Those who doubted were surprised when wireless-equipped ships picked up messages across 250 miles. And when the 'S' from Poldhu was intercepted in Newfoundland, not only the hymers were amazed; distinguished theorists too, were astonished. From the very beginning I learned that it is unwise to put any limitations on the range of electric waves.

"Long experience has taught me not always to believe in the limitations indicated by purely theoretical considerations or calculations. These—as we well know—are often based on insufficient knowledge of all the relevant factors. I believe, in spite of adverse forecasts, in trying new lines of research, however unpromising they may seem at first."

That doctrine Marconi is following today. He is on the track of micro-waves—tiny impulses or ripples in space measured from crest to crest, in centimeters.

It was at Salisbury Plain in England, back in the Gay Nineties, that Marconi first caught a glimpse of the ultra-short waves. But they were extremely elusive. They were tricky in performance, and seemed to lack the power to leap very far. The inventor was aware that longer waves were less delicate; they swept over longer distances. And in the Nineties distance lent enchantment to wireless. With the enthusiasm of youth Marconi sensed that the road to success could be reached more quickly by the use of long waves, so he laid the pioneer reflectors aside and wooed waves measured in yards and miles. On their wings he rode to fame.

But he never forgot the micro-waves. Their mystery and strange actions made a deep impression on his mind. Some day he would go back to them. And that day was hurried by the necessity for secret and short-wave communication on the battlefields of the World War. The ultra-short wave beams, directed to army outposts by reflectors, were just the thing needed in the trenches. Fifteen years had wrought vast changes in wireless paraphernalia, and now Marconi had vacuum tubes. They were ideal for micro-waves.

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THE inventor bought a yacht in 1919, named it Elettra and went to sea to learn all he could about short waves and ultra-short waves. They are his theme of 1933, and on the wings of the tiny waves he predicts that radio is flying into a new era.

High above Manhattan Island, on the fifty-third floor of a skyscraper in Radio City, Marconi talked about the micro-waves. They have teased him, as some one remarked, "to drive past the warning lights into forbidden highways of science." For the micro-wave spectrum in radio has long been called "a graveyard—a dead area in space."

"'Quasi-optical' is the term used by scientists to describe the micro-waves with which I am now experimenting," said Marconi. "It indicates a belief that the waves have optical properties, and because they are so short from crest to crest many have believed that these electric impulses would not go beyond the horizon. Already we have proved this to be wrong. In my latest experiments on board the Elettra, I have picked up readable signals coming more than 100 miles."

Once the micro-wave apparatus was taken ashore at Golfo Aranci, Sardinia, and installed in a tower of the signal station at Cape Figari. The transmitter was at Rocca di Papa, 168 miles away. Apparently the old quasi-optical theories were wrong because signals were intercepted, although the optical distance or theoretical horizon, considering the altitude of the two places, was seventy-two miles.

"We employ reflectors and project the signals into the sky," said Marconi. "Whether they strike the Heaviside surface, or 'radio roof,' as it has been called, to be reflected back to the earth like waves of greater length, I do not know. Further research is necessary to determine what lifts these micro-waves across the curvature of the earth.

"I'll tell you one thing definitely," the inventor added, "the micro-wave spectrum is not affected by *static, our old enemy in wireless.* I have listened to micro-waves during a thunderstorm and there was no direct trace of the static, despite the lightning. Some fading is experienced; however, it is not as noticeable as on longer waves. I'll stake my reputation on the fact that static does not bother micro-wave communication."

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PROBABLY no single difficulty has ever annoyed Marconi more than static. It has been the bugbear of all wireless. To find a realm in which it does not splash and click is a joy to those who have wondered how to dodge the atmospheric nuisance.

"If we succeed in sending the micro-waves over long distances, the whole radio system is likely to be revolutionized," said Marconi. "The equipment is extremely simple, compact and inexpensive, but the price of pioneering and experimenting is costly. Installation costs of the first transatlantic signal were $200,000. Business and financial minds have had to work along with science; science alone could never have developed such an industry as that of radio today."

It was recalled to him that, when the first bulletin came from Rome early this year announcing success in "bending" electromagnetic waves, there was considerable conjecture in American engineering circles as to whether the tiny waves were actually bent or merely reflected from the Heaviside layer at lofty altitudes.

Do the micro-waves penetrate the mountains or glide over the tops?

"You've got me there," he confessed. "I dont know. We must conduct further experiments."

In view of the fact that television research laboratories here and abroad are concentrating on micro-waves, Marconi was asked what part he expected such waves to play in image broadcasts.

"There is one distinct advantage I can see," he replied. "If the static is missing, the pictures will not be streaked. Television, I believe, still belongs to the research

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laboratories, and as I reflect upon it, I often wonder if seeing by radio is as important as hearing. To illustrate what I mean, remember many animals have keener sight than humans, but man has the power of speech. That gives him dominance over beasts. For example, a politician can speak to a vast audience, and what he says is likely to be more important to him and to the people than merely his picture. Of course, I am aware that sound-sight is a powerful force. But in my opinion the sound portion of the radio program will survive, despite radio-vision, and will be the more important element."

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THE vacuum tube is the crystal ball of science in which Marconi looks when he tries to read the future. So marvelously efficient it is that, he complains with a smile, ethereal echoes disturb him.

"Listening in during experiments on my yacht," he said, "I have heard words come back to me three or four times after they had encircled the world. This is especially noticeable on the nine-meter wave."

These phantom waves that race around the earthly sphere tease the inventor, and he humorously remarked that "the world is too small as a research laboratory—but what can we do about it?"

It was suggested that possibly he could enlarge the laboratory to encompass the universe and experiment with other planets.

"Well, I've sent many a message that never got anywhere," he chuckled. "They may be in the Stone Age in the other worlds and not ready to pick up our signals. Radio travels a long way into space, but whether it reaches the stars, who knows? It would depend on whether the electric waves are entirely absorbed in the earth's atmosphere; it is also important that the other planets be inhabited, you know."

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SOME years ago, Dr. Michael I. Pupin, welcoming Marconi to the Institute of Radio Engineers, remarked that the audience had not gathered, "so much to hear what you have to say, but to see your boyish smile." Marconi in 1933 has not lost that famous smile. His keen sense of humor flows through his conversation.

New Yorkers who see him usually observe that in his double-breasted blue suit he looks more like an Englishman than an Italian. His mother, Anna Jameson, was born in Ireland, and his father, Giuseppe Marconi, was an Italian banker. Their second son, Guglielmo (the Italian for William), more closely resembles his mother, and the resemblance is more noticeable as the years pass. As a young man Marconi went to England; in fact, he left Italy after his first wireless triumphs to conduct further tests in the British Isles. He calls London his second home. Bologna is first, although for the past decade he has spent much time in the vicinity of Rome and on board the Elettra than in his birthplace.

One might expect the conversation of this winner of the Nobel Prize and many other honors to be highly technical—one might expect him to talk in the language of watts, ohms and volts. But not so. Simplicity is one of Marconi's outstanding characteristics. Several days ago, in a discussion of his achievements on the 15-meter wave, some one inquired, "How many kilocycles is that?"

Marconi smiled shyly like a schoolboy who had missed a lesson and replied, "Oh, off-hand I don't know how many kilocycles it is."

There is no bluff in the Marconi make-up; he does not conceal what he does not know, in a maze of technical terms. He has always measured waves in meters; kilocycles are a comparatively new-fangled idea of technicians.

Last week in his New York hotel suite, a veritable arbor of American Beauty roses, with baskets of chrysanthemums to give a hint of Autumn, Marconi looked back across thirty-nine busy years to the time when he first caught the vision of wireless.

"My mother encouraged me; she had faith in what I was doing," he said. "My father was skeptical until I got results." He smiled as he recalled the boyish delight he took in convincing his unbelieving parent that signals could be flashed through the emptiness of space.

"I'll tell you," he said, "if you set your heart and soul upon doing a thing you can do it."

RADIO SPIRE

Wendell McRae.